

FINAL REPORT TO AFOSR

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Support and Sponsorship of the International Semiconductor Device Research Symposium (ISDRS) 2007.

www.ece.umd.edu/isdrs2007

Project Director:

Dr. Agis A. Iliadis,
Electrical and Computer Engineering Dept.,
University of Maryland
College Park, MD 20742
301-405-3651

I. Project Summary

The ISDRS is a well-established biannual Conference that attracts over 300 participants from the US, Asia, and Europe. The Symposium emphasizes student participation and international research scientist participation, dealing with advanced concepts in devices, materials, and fabrication technologies. It provides an important forum for extended personal scientific interaction, and a relaxed and fostering environment for students entering the field of microelectronic devices and technology. As such it has become a key Conference in bringing together diversified participation, extending from new materials and processes to novel devices and applications.

The 2007 International Semiconductor Device Research Conference (ISDRS 2007) was held at the Stamp Union of the University of Maryland at College Park, Maryland on December 12-14, 2007. The Symposium is technically sponsored by the IEEE Electron Devices Society, IEEE LEOS, and the AFOSR, NSF, ARO, NIST, the Maryland NanoCenter, and the University of Maryland College Park.

This year more than 360 attendees representing 25 states and 27 countries participated and presented their work. There were 3 plenary, 189 oral, and 133 poster presentations in four parallel sessions.

Three excellent plenary talks were presented that provided the general theme of the Symposium. The plenary talks were by:

1. Dr. Robert Chau of Intel Corporation, on “The Challenges and Opportunities of Emerging Nanotechnology for Future VLSI Nanoelectronics”.
2. Dr. Mark S. Lundstrom, of Purdue University on “The Ultimate MOSFET and the Limits of Miniaturization” and
3. Dr. Mark Rosker of the Defense Advanced Research Projects Agency (DARPA), on “The Coming Revolution in RF”.

Invited and contributed presentations covered a broad and diverse range of device, nanotechnology,

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14. ABSTRACT Revolutionary technologies may be required to sustain the information economy. Markets such as computing, communications, internet, networking, wireless and appliances have primarily driven the microelectronics industry. In addition to sustain these markets, the microelectronics and nanoelectronics industry needs to develop technologies for emerging markets such as medical/health, security, intelligent appliances/ robotics, energy etc. Early recognition of new possibly disruptive technologies for communication and information processing is a critical defense-relevant issue. The workshop is designed to address the many aspects of microelectronics, nanoelectronic and information processing technology to determine their current state and to comprehend most promising directions for future research. Potential impact for these areas of novel and futuristic device concepts include electronics for military environments, polymer-based opto-electronic materials and devices, ultra high frequency devices and RF effects on devices, target detection and recognition, and high speed image processing.						
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and electronic materials topics, including wide band-gap devices and materials, novel devices and phenomena, optoelectronics, novel dielectrics, nanoelectronics, sensors, advanced silicon devices and processing, high frequency devices, MEMS, materials and device characterization, and simulation and modeling. Such a range of topics fostered a cross-fertilization of the different fields related to futuristic semiconductor devices and the materials technology necessary to develop them.

II. ISDRS Symposium Officers and Sponsors

This year the Symposium had an excellent and diverse group of officers from government agencies and universities. Dr. Phillip Thompson (NRL), was the Symposium Chair with general oversight of the conference, including facilities and technical program, Dr. Jerry Woodall (Purdue University) was the Symposium Co-Chair, Dr. Neil Goldsman (University of Maryland, College Park) was the Technical Program Chair, and Chairman of the Program Committee, charged with the selection of topic areas, and outstanding scientists and engineers to champion topic areas. Dr. Curt Richter (NIST) was the Technical Program Co-Chair, and the Co-Guest Editor of the Special Issue of Solid State Electronics. Dr. Agis Iliadis (University of Maryland, College Park) was the Treasurer, in charge of submitting proposals to potential sponsors and the finances of the conference. He was also the Guest Editor of the Special Issue of Solid State Electronics with selected manuscripts presented at the Symposium. It should be noted that all members of the symposium steering committee (not listed here) have been very active in determining the site, selecting topics and topic champions, and contributing to the overall meeting planning.

The University of Maryland was the official hub of the Symposium, and the University of Maryland Convention and Visitor Services (CVS) were engaged to do the day-to-day planning and running of the Symposium. Our CVS representative, Lisa Press, has been with us on all of the site visits to potential locations and received bids from the locations. CVS handled the registration process and all subcontracts. This year, the Symposium was located at the Stamp Student Union at the University of Maryland, which greatly enhanced the image of the conference as a University based conference.

AFOSR (Bolling POC: Pomrenke) was one of the main official sponsors of the Symposium, and they were acknowledged in all the Symposium publications and web sites. These included the Symposium announcements, the Proceedings volume, the Special Issue of Solid State Electronics, and our web site.

III. Impact to DoD and Scientific Community

The impact to DoD and the community was significant through the dissemination of information and the fostering and interaction of students, engineers and scientists on the “hot” topic areas of the Symposium. The Symposium addressed a broad area of topics of interest to the DOD in Electronic Device and Materials, such as Molecular Electronics, THz Devices, Biosensors, Silicon on Insulator, Nanoelectronics, that have strong DoD applications. Many of the presenters were and are supported by DoD funding for their work. As an International Conference, we also have presentations from leading scientists from around the world. We take a special interest in encouraging student participation, and promoting education. This year a special topic on "Engineering Education in Electronic Materials and Devices" was introduced.

IV. Symposium Publications

Dissemination of information was in the form of a Proceedings volume and a Special Issue in Solid State Electronics.

1. The ISDRS'07 Proceedings volume edited by Dr. Ken Jones (ARL) contained the two page extended abstracts of all reviewed and accepted presentations. This is an IEEE publication available through the XPLORE web site.
2. The participants were invited to submit full manuscripts for the Special Issue of Solid State Electronics. A total of 106 manuscripts were submitted, which were sent out for review by both the ISDRS Guest Editors and the Editor of Solid-State Electronics. The 4th ISDRS Special Issue of Solid State Electronics contains the full-length manuscripts selected through this rigorous review process. The special issue is currently available in electronic form at the publishers web site (www.elsevier.org) Solid State Electronics.

V. Symposium Awards

The Symposium offers one prestigious award, the “van der Ziel” award to highly acclaimed scientists. Based on the Selection Committee recommendation, Dr. Dieter Schroder, Professor of Electrical Engineering at the University of Arizona was the winner of the “van der Ziel” award for his distinguished career as an educator and researcher. The award was presented to Dr. Schroder at the Symposium.

Four best paper awards were given to students. Two for best oral paper and two for best poster paper. The titles and students are given here:

Best Oral Papers

- **Materials:**
FA7-02, "Epitaxially Grown Graphene Field-Effect Transistors with Electron Mobility Exceeding 1500 cm²/Vs and Hole Mobility Exceeding 3400 cm²/Vs"
Yanqing Wu, Peide D. Ye, Michael A. Capano, Tian Shen, Yi Xuan, Yang Sui, Minghao Qi, and James A. Cooper Jr., Purdue University
- **Devices:**
FP3-03, "Characterization of Latch-Up in CMOS Inverters in Pulsed Electromagnetic Interference Environments"
Kye-chong Kim and Agis A. Iliadis, University of Maryland

Best Poster Papers

- **Materials:**
WP9-02-03, "A Quantum Mechanical Mobility Model for Scaled NMOS Transistors with Ultra-thin High-K Dielectrics and Metal Gate Electrodes"
Yanli Zhang, Zhian Jin, Gan Wang, Luckshitha S. Liyanage, and Marvin H. White, Lehigh University

- **Devices:**
WP9-18-05, "Design and Characterization of a Gain-Enhanced Floating Gate-body Tied Photodetector in Silicon on Sapphire CMOS"
Miriam Adlerstein Marwick and Andreas G. Andreou, Johns Hopkins University

VI. Concluding Remarks

The 2007 ISDRS was particularly successful this year with large participation and high quality presentations emphasizing new and emerging technologies fundamentally capable of changing the way of thinking in electronic materials and device development.

The sponsorship of AFOSR and other agencies helped significantly in making the ISDRS'07 successful by keeping the cost of student registration low and providing a high quality forum for the interactive representation of their work.